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(54) RAILWAY VEHICLE HUB AND DISC ASSEMBLY

(71) We, GIRLING LIMITED, a British company of Kings Road, Tyseley, Birmingham 11, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement :—

In axle-mounted disc brakes for railway vehicles, it is a well known techniques to secure a hub on an axle for rotation therewith, the hub having a radially extending peripheral portion to which the brake disc is secured.

It is also known to connect the disc to the hub in a manner permitting radial expansion of the disc relative to the hub, for example, by keying the disc to the hub through the intermediary of radially extending splines on one part and corresponding grooves on the other, so that the parts are locked against relative rotations but radial expansion is still permitted.

Prior constructions of this latter form have been expensive to manufacture and unduly liable to rapid wear in use, and it is a primary object of the present invention to provide an improved assembly which removes or reduces these disadvantages.

In accordance with the present invention there is provided an assembly in or for a railway vehicle, comprising an axle-mounted hub, and a brake disc having an inner peripheral flange which is clamped against a radial face of the hub by an annular clamping member positioned against the side of the flange remote from the said radial face of the hub and a plurality of tensionable fasteners which pass with clearance through holes in the disc flange and are received in openings provided in the clamping member and the radial face of the hub, the openings substantially registering with the clearance holes in the flange and the fasteners being tensioned sufficiently to clamp the flange between the clamping member and the hub with such a force that braking torque is transmitted from the disc to the hub solely by frictional engagement between the disc and the hub.

With this arrangement a secure assembly is achieved in a simple manner. Thermal expansion of the disc is allowed for, without the complication of machined spline and keyways, and the clamping member serves to protect the fasteners against bending stresses arising upon thermal expansion of the disc.

Manufacture, assembly and maintenance are further facilitated, in accordance with preferred features of the invention, by making the disc and the hub in separate segments which are releasably secured together in the assembly. The hub itself may provide radial location for the disc and clamping member, or these main components may all be located at the inner peripheries by the axle itself.

Some forms of disc and hub assembly and modifications thereof are described in detail below, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a part sectional side view of a first assembly.

Figure 2 is a half-sectional end view of the same assembly;

Figure 3 is a part-sectional side view of a second assembly;

Figure 4 is a scrap plan view on the second assembly;

Figure 5 is a half-section on the second assembly;

Figure 6 is a view like Figure 5 of a modification;

Figure 7 is a sectional part side elevation illustrating another modification; and

Figure 8 is a sectional part and elevation showing yet another modification.

The assembly shown in Figures 1 and 2 comprises a hub 1 formed in separate halves 1A and 1B securely connected together by bolts 2 extending generally tangentially of the hub; a brake disc in two halves 3A, 3B secured together by bolts 4; and a solid, annular clamping member 5 which clamps an inner peripheral mounting flange 6 of the disc 3 against one radial end face of the hub 1 with the assistance of bolts 7 or other tensionable fasteners such as "Huck" fasteners, sold under the Registered Trade Mark "Huckbolt".

The disc here illustrated is of double walled construction presenting opposed braking surfaces 8 and 9, the two walls being interconnected by spaced radial webs 3C defining air cooling passages. The bolt holes through the mounting flange 6 are of larger diameter than the bolts, this clearance permitting radial, thermal expansion of the disc 3 relative to hub 1 in use. The openings in the hub and the clamping member which receive the bolts register with the bolt holes in the mounting flange.

The bolts are tightened sufficiently to ensure that drag forces arising during braking are transmitted by the firm frictional engagement between the mounting flange 6 and the hub, and without the bolts being submitted to substantial shearing stresses. The hub itself is secured for rotation with the axle by a key 10 mounted in one half of the hub.

The two halves of the disc are secured together in abutting relationship in a single radial plane coincident with the axis of the assembly, the bolts 4 passing through heavy section flanges 11, preferably with bushes 12.

The segmented construction of the hub and brake disc obviously permits fitting of the assembly over an axle *in situ*, thus facilitating inspection, maintenance and repair.

The embodiments shown in Figures 3 to 6 are generally similar to that described above, corresponding parts being given the same reference numerals.

As best seen in Figures 3 and 4, the brake disc halves 3A and 3B are secured together with the assistance of bridge pieces 12', the bolts 4 extending chordally of the disc and parallel with each other. One bolt is shown fitted with the assistance of a bush 13 while the other is shown as a close fit in the disc web. All the bolts would, of course, be fitted in the same manner.

In the first embodiment, the hub, disc and clamping member are all located radially by the axle, but in the second embodiment, as shown in Figure 5, the disc flange 6 and clamping member 5 are located over the hub, which has an outwardly projecting flange 14, the disc flange 6 being secured against the inner face of flange 14.

In the modification shown in Figure 6, the hub has an outwardly projecting axial spigot 15 which locates the clamping ring 5 and the disc flange 6, which is now clamped against the outer radial face of the hub flange 14.

In the modification shown in Figure 7, the bolts 4 securing the disc halves together are angled to the point plane, to afford easy access to the heads of the bolts, with only one adjacent cooling fin 3C being shortened to permit this access.

Figure 8 illustrates an eccentric location of the bolts 7, relative to the clearance holes through disc flange 6. The bolts are arranged on a pitch circle whose diameter is greater than the pitch circle diameter of the holes through flange 6, so that, in the cold condition of the disc, there is more radial clearance inwardly of the bolts than outwardly, which additional clearance allows for thermal expansion of the disc in use. Thus more clearance is provided for a given hole size, or alternatively, a given clearance is obtainable with a smaller hole size, which avoids unnecessary weakening of the disc flange 6.

In all the above embodiments, a simple assembly is provided which is also readily demountable for maintenance. The bolts 7 are subjected substantially only to tensile forces, since drag forces are transmitted solely and directly by frictional engagement between the disc and the hub. Furthermore, the bolts are protected against substantial bending stresses by the action of the annular clamping member 5, which, being interposed between the disc flange 6 and the heads of the bolts absorbs the bulk of the radial forces generated by thermal expansion of the disc. The clamping member could equally perform this function if formed as an annulus with an irregular outer periphery having radial lugs or fingers, one for securing each bolt 7.

WHAT WE CLAIM IS :—

1. An assembly in or for a railway vehicle, comprising an axle-mounted hub, and a brake disc having an inner peripheral flange which is clamped against a radial face of the hub by an annular clamping member positioned against the side of the flange remote from the said radial face of the hub and a plurality of tensionable fasteners which pass with clearance through holes in the disc flange and are received in openings provided in the clamping member and the radial face of the hub, the openings substantially registering with the clearance holes in the flange and the fasteners being tensioned sufficiently to clamp the flange between the clamping member and the hub with such a force that braking torque is transmitted from the disc to the hub solely by frictional engagement between the disc and the hub.

2. An assembly in accordance with claim 1 wherein the hub, the disc flange and the clamping member are all located at their inner peripheries on the axle.

3. An assembly in accordance with claim 1, wherein the disc flange and the clamping member are located over a cylindrical portion of the hub.

4. An assembly in accordance with claim 3, wherein the disc flange is secured against an outwardly projecting peripheral flange formed on the hub.

5. An assembly in accordance with any preceding claim, wherein the brake disc is formed in a plurality of separate segments which are releasably but securely connected together about the axle.

6. An assembly in accordance with any preceding claim, wherein the hub is formed in two halves, securely but releasably connected together about the axle.

7. An assembly in accordance with any preceding claim, wherein the clearance holes in the disc flange are set in a smaller pitch circle diameter than the fasteners in the cold condition of the disc, thereby providing additional clearance for the fasteners allowing thermal expansion of the disc in use.

8. An assembly in or for a railway vehicle, substantially as herein described with reference to Figures 1 and 2, or Figures 3 and 4 or Figure 5 of the accompanying drawings.

9. An assembly in or for a railway vehicle, substantially as herein described with reference to Figures 6 and 7 of the accompanying drawings.

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1412758 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

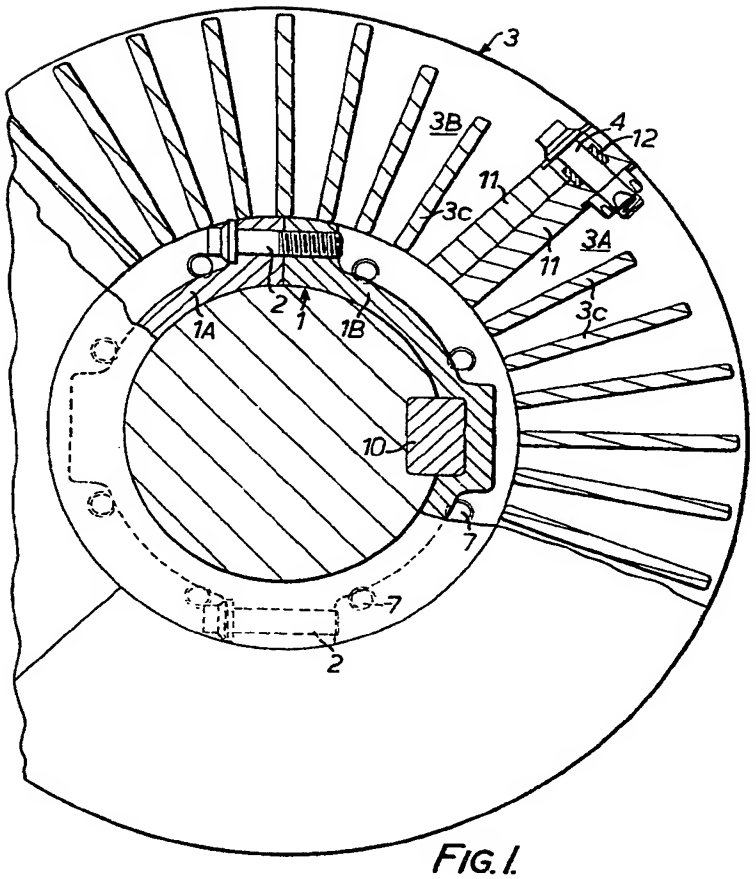

FIG. 1.

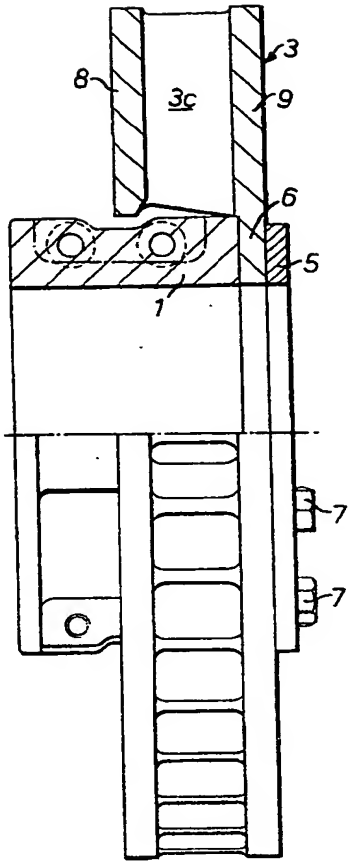

FIG. 2.

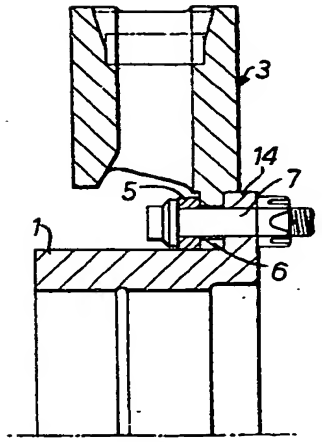

FIG. 5.

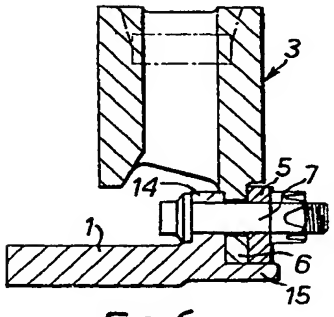

FIG. 6.

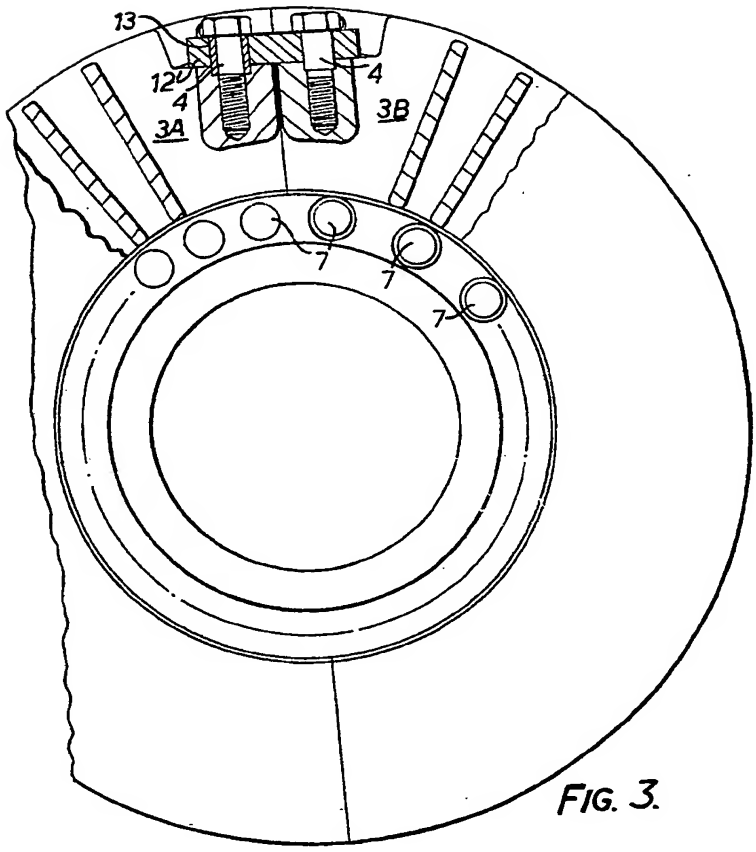

FIG. 3.

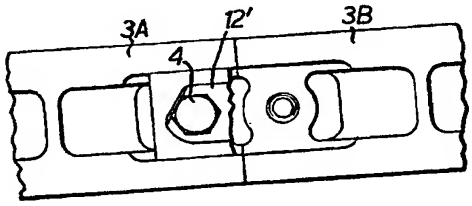

FIG. 4.

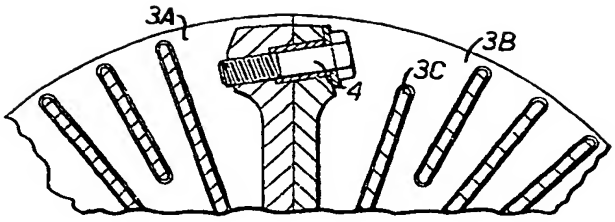

FIG. 7.

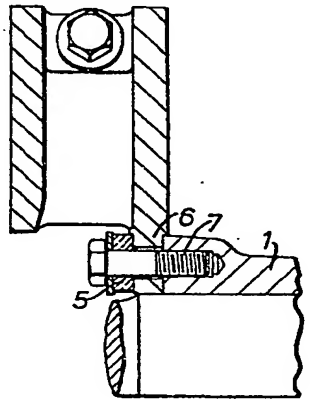

FIG. 8.